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EXAMINER	
ARCIERO, ADAM A	

ART UNIT	PAPER NUMBER
1795	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/525,450	WALTER, MARKUS	
	Examiner	Art Unit	
	ADAM A. ARCIERO	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *27 March 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *19-38* is/are pending in the application.

4a) Of the above claim(s) *36-38* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *19-35* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *27 March 2009* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

FUEL CELL WITH REGULATED OUTPUT

Examiner: Adam Arciero S.N. 10/525,450 Art Unit: 1795 July 27, 2009

DETAILED ACTION

1. The Applicant's amendment filed on March 27, 2009 was received. Claims 19-38 currently pending. Claims 19, 24-26, 28, 30 and 32-35 are amended.

Election/Restrictions

2. Newly submitted claims 36-38 are directed to an invention that is independent or distinct from the invention originally claimed for the following reasons: The subject matter of the aforementioned claim is a fuel cell system comprising a fuel cell stack; an intermediate electrical accumulator; a common supply connector for coupling the fuel cell stack and intermediate electrical accumulator to an electrical consumer; at least one sensor being arranged and configured to sense an individual internal operating parameter of at least on of the fuel cells; a switch arranged and configured to be controlled to be in one of an open state and a closed state, the open state electrically isolating the fuel cell stack from the intermediate electrical accumulator and the common supply connector, and the closed state electrically coupling the fuel cell stack to the intermediate electrical accumulator and the common supply connector; and a control circuit for controlling the state of the switch between the open state and the closed state as a function of the sensed operating parameter, the control circuit causing the switch into the open state when the operating parameter undershoots a lower limit value and causing the switch into the closed state when the operating parameter exceeds an upper limit value. The subject matter of the aforementioned claim is a distinct species from the "fuel cell system comprising a

control circuit for dynamically controlling the state of the switch between the open state and the closed state as a function of the sensed operating parameter, as recited in the original claims.

Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claim 28 is withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

3. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claim Rejections - 35 USC § 112

4. The claim rejections under 35 U.S.C. 112, second paragraph on claims 30 and 32 as having insufficient antecedent basis are withdrawn, because Applicant has amended the claims.

5. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

6. Claims 19-35 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Independent Claim 19 recites the phrase "a control circuit for dynamically controlling

the state of the switch..." on line 12 of the claim. The specification, drawings and the original claims do not provide support for this limitation.

Claim Rejections - 35 USC § 102

7. The claim rejections under 35 U.S.C. 102(b) as being anticipated by AUTENRIETH et al. (US 2002/0057066 A1) on claims 19, 22-25, 31-32 and 34-35 are maintained.

As to claim 19, Autentrieth et al. discloses a fuel cell system comprising a fuel cell (3), an electric circuit (9) which electrically connected the fuel cell and the battery (intermediate electrical accumulator, 8) to the ballast resistor (electrical consumer, 12), a pressure sensor (14), and a switch (10) where in the open state, the fuel cell is electrically connected to the battery and ballast resistor and in the closed state, the fuel cell is electrically disconnected from the battery and ballast resistor. Said electric circuit dynamically controls the state of the switch between the open state and the closed state as a function of the sensed pressure values (pg. 2, [0025]).

As to claim 22, Autentrieth et al. discloses the switch is thermally coupled to the fuel cell (see figure 2).

As to claim 23, Autentrieth et al. discloses the switch is situated at the end of the stack (see figure 2).

As to claim 24, Autentrieth et al. discloses that the switch is controlled by the load requirements of the system (paragraph 29). The switch is controlled by pulse-width modulation (i.e. pulse width due to a variable function as discussed in paragraph 16) which is a pulse duty factor variable as an operating parameter as defined in paragraph 13 of the instant disclosure.

As to claim 25, Autentrieth et al. discloses that the switch is open when the load requirement exceeds the fuel cell output (paragraph 21). When the fuel pressure is above the threshold, the switch is closed (paragraph 30).

As to claim 30, Autentrieth et al. discloses the switch is on of off depending on the hydrogen pressure (paragraph 25).

As to claim 31, Autentrieth et al. discloses a pressure sensor (14) that is located upstream of the fuel cell (see figure 2).

As to claim 32, Autentrieth et al. discloses that the switch is off (open state) when the pressure is below a predetermined value (paragraph 29); the switch is on (closed) when the pressure is above a threshold (paragraph 30).

As to claim 34, Autentrieth et al. discloses the fuel cell is coupled to a reformer (paragraph 11).

As to claim 35, Autentrieth et al. discloses that the switch is open when the hydrogen pressure of the fuel cell is low due to consumption and increase in power requirement (paragraph 30). The fuel cell is switched off (open state) until the fuel quantity reaches a threshold where the fuel cell provides more electric power (paragraph 30).

Claim Rejections - 35 USC § 103

8. The claim rejections under 35 U.S.C. 103(a) as being unpatentable over AUTENRIETH et al. and GLENNON on claims 20-21 and 26, AUTENRIETH et al. and UENO et al. on claims 27-28 and 33, AUTENRIETH et al. and NONOBE on claims 29-30 are maintained.

As to claims 20-21, Autenrieth et al disclosed a fuel cell as discussed above; however, the reference does not explicitly disclose the type of switch used. Glennon disclose a power switching circuit comprising a metal oxide semiconductor field effect transistor (MOSFET) capable of high switching speeds (1: 10-12). The reference teaches the turn on delay time of the switch is in the order of 35 nanoseconds and the turn off delay time is 150 nanoseconds (2: 41-45). Therefore, it would have been obvious to one of ordinary skill in the art to use a MOSFET switch in the fuel cell system of Autenrieth et al, because Glennon teaches MOSFET switches have high speed switching action which is needed for powering loads from a DC supply.

As to claim 26, Autenrieth et al does not explicitly disclose the pulse frequency is between 0.1 to 50 kHz. Glennon teaches the switching circuit uses modulated pulses to control the switch (1: 58-65). Furthermore, the switch is controlled by width modulation (2: 10-12) and the frequency of the control signal is in the order of 10 kHz (2: 46-48). Therefore, it would have been obvious to one of ordinary skill in the art to control a switch using width modulated pulses in the fuel cell system of Autenrieth et al, because Glennon teaches the frequency of the pulse width modulation to control the power load is in the order of 10 KHz.

9. The claim rejections under 35 U.S.C. 103(a) as being unpatentable over AUTENRIETH et al. and UENO et al. on claims 27-28 and 33 are maintained.

As to claims 27 and 28, Autenrieth et al. disclosed a fuel cell as discussed above; however, the reference does not explicitly state the presence of a voltage sensor and a control system based on output voltage of the fuel cell.

However, Ueno et al. teaches an output voltage sensor detects the fuel cell voltage (paragraph 20). The reference states said sensor prevents an excessive load on the fuel cell; the excessive load may damage the electrolyte membrane in the fuel cell (paragraph 20). Therefore, it would have been obvious to one of ordinary skill in the art to incorporate a voltage sensor in the fuel cell of Autenrieth et al. and use it to control the switch, because Ueno et al. teaches the electrolyte membrane of the fuel cell may be damaged due to the high voltage required from the load.

As to claim 33, Autenrieth et al. disclose pulse-width modulation signals are used to control the switch; however, the reference does not explicitly disclose applying the same control scheme to a gas feed line valve.

However, Ueno et al. disclose a pressure sensor (25) situated downstream of a valve (21) in the fuel stream (10a). The reference states hydrogen gas is regulated at a pressure range and if the pressure is below this range, hydrogen gas may be leaking; if the pressure is over the predetermined range, the valve may be malfunctioning (paragraph 44). Additionally, Ueno et al states a high gas pressure may damage the electrolyte membrane (paragraph 44). Therefore, at the time of invention, it would have been obvious to use the pulse-with modulation signal control scheme of Autenrieth et al. to measure the pressure of a gas stream and control the valve, because high pressure may damage the electrolyte membrane of the fuel cell and a low pressure stream may be indicative of a fuel leak.

10. The claim rejections under 35 U.S.C. 103(a) as being unpatentable over AUTENRIETH et al. and NONOBE on claims 29-30 are maintained.

As to Claims 29-30, Autenrieth et al disclosed a fuel cell as discussed above; however, the reference did not explicitly specify which type of sensor and the opening or closing of the switch based on resistance. Nonobe disclosed a resistance detector (48) in the fuel cell system. The reference states the proton conductivity of the electrolyte changes with the humidity of electrolyte which affects resistance (paragraph 32). Furthermore, Nonobe disclose abnormality of the fuel cell is detected if humidification of the electrolyte membrane does not change; thus operation is ceased to avoid damage of the fuel cell. Therefore, it would have been obvious to use a resistance sensor in the fuel cell system of Autenrieth, because Nonobe teaches proton conductivity of the electrolyte is affected by the internal resistance of the fuel cell and to measure the internal resistance to avoid damage to the fuel cell.

Response to Arguments

11. Applicant's arguments filed on March 27, 2009 have been fully considered but they are not persuasive.

Applicant's principal arguments are:

a) Autenrieth et al. does not disclose "a sensor coupled to the fuel cell for sensing an internal operating parameter of the fuel cell" (claim 1).

b) the combination of Autenrieth et al. and Ueno et al. does not disclose the limitations of claims 27 and 28.

c) Nonobe does not teach or suggest the control circuit of which is arranged and configured to control the state of the switch based on an internal resistance sensor (claims 29 and 30).

In response to Applicant's arguments, please consider the following comments.

a) Autenrieth et al. discloses a pressure sensor which measures the pressure of the fuel supply to the anode (pg. 2, [0025]). The anode fuel supply pressure is an internal operating parameter of the fuel cell as Autenrieth et al. discloses that the fuel cell supplies electric power until the available quantity of fuel drops below a specified threshold value (pg. 2, [0030]).

b) Autenrieth et al. teaches the fuel cell system of claim 19 as discussed above. Ueno et al. discloses the use of a voltage sensor to control a fuel cell system. It would be obvious to one of ordinary skill in the art to modify the system of Autenrieth et al. with a voltage sensor, because Ueno et al. teaches that a fuel cell system can be controlled based on the sensed voltages and comparing them to threshold values.

c) Autenrieth et al. teaches the fuel cell system of claim 19 as discussed above. Nonobe discloses the use of an internal resistance sensor to control a fuel cell system. It would be obvious to one of ordinary skill in the art to modify the system of Autenrieth et al. with an internal resistance sensor, because Nonobe teaches that a fuel cell system can be controlled to protect the proton conductivity of the electrolyte membrane, which is affected by humidification, based on the sensed internal resistances and comparing them to threshold values.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ADAM A. ARCIERO whose telephone number is (571)270-5116. The examiner can normally be reached on Monday to Friday 8am to 5pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dah-Wei Yuan can be reached on 571-272-1295. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

AA

/Dah-Wei D. Yuan/
Supervisory Patent Examiner, Art Unit 1795